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This survey of opinions of architects, certified public accountants, and educators (who have written concerning, shown leadership in, or have specialized knowledge about warehousing) covers the planning, organizing, material handling, and paper processing of presently operated school district central warehouses. All recommendations concerning central warehousing for school districts serving 300 or more students, and/or with six or more buildings located on separate sites, were derived from a jury opinion of the aforementioned experts. Criteria for validation of the recommendations made in this survey were affirmed when jury ayes were three times the nays. Appendices list percentages of favorable responses on suggested warehousing practices from school districts operating central warehouses, one model each for functional operation of smaller and larger (no criteria is given for "smaller" and "larger") school district warehouses, and a bibliography. (RLP)

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# CRITERIA FOR CENTRALIZED WAREHOUSING PROCEDURES IN PUBLIC SCHOOL DISTRICTS

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# CRITERIA FOR CENTRALIZED WAREHOUSING PROCEDURES IN PUBLIC SCHOOL DISTRICTS

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The research reported herein was performed pursuant to a contract with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

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## INTRODUCTION

Although public school districts in this country have been purchasing and storing materials since the early part of the seventeenth century, central warehousing did not become common until the early 1900's. Large city school districts were the first to utilize central warehousing to handle the large amounts of materials purchased annually to supplement the instructional process. In these districts, the practice arose of delivering materials to a central location for processing and storage before being disseminated to each individual building within the school district.

The concept of central warehousing was gradually adopted by smaller school districts as enrollments and need for instructional materials increased. School district reorganization which resulted in the formation of larger units also brought about a greater need for more sophisticated storage methods.

Instruction in the early twentieth century classroom was supplemented by large amounts of materials not present in the early colonial schoolrooms. The desire of school officials to exercise more control over the supplies and materials that were purchased also helped to establish central warehouses. The control of materials was both fiscal and physical.

School officials for the most part adopted centralized procedures without benefit of responsible research more common in the area of business services. The impetus for centralized warehousing was derived almost solely from the large volume of materials that were being used annually to help educate the increasing number of students. As a result,

receiving, storing, and distributing materials had become an important and necessary part of the school districts' business services by 1968.

## OBJECTIVES

The purpose of the study was to determine criteria for warehousing procedures in public schools in the United States. Essential to the main purpose of the study was the determination of receiving, storing, and distributing procedures currently in use by these school districts. A further purpose was to design operational model based on these criteria.

## PROCEDURE

To determine criteria for warehousing procedures, the study was divided into five phases. These phases were: (1) the determination of tentative criteria; (2) the validation of the tentative criteria; (3) the preparation of a survey instrument based on the established criteria; (4) the survey of the public school districts; and (5) the final recommendations and establishment of models.

The determination of tentative criteria. The tentative criteria were developed from many sources. Books, periodicals, and warehouse manuals were intensively studied to provide sufficient background for the formulation of the tentative criteria. Attention was given to discovering not only the current status of warehousing procedures, but also the historical trends and development.

Visits were made to public school and industrial warehouses to observe procedures, problems, and techniques. A log of events and findings were recorded as a result of these visits. Interviews with warehouse directors, accountants, architects, teachers, and principals were conducted to increase the reliability of the tentative criteria.

The validation of the tentative criteria. Validation of the criteria was achieved through the use of the jury technique. Eighteen jurors agreed to participate in this study. An interdisciplinary approach was utilizaed in selecting the jury. Architects, certified public accountants, and educators were included on the list. They were selected on the basis of their participation in one or more of the following activities: (1) some writing in the field of warehousing; (2) outstanding leadership in the development of warehousing procedures; or (3) specialized knowledge in warehousing.

Tabulation of the data returned from instruments provided the basis for validating the tentative criteria. Each statement was considered valid when as many as three times the number of jurors agreed as disagreed with the statements.

The preparation of a survey instrument. A survey instrument to determine current practice was prepared for dissemination to the directors of public school warehouses in the United States. The survey instrument contained the criteria validated by the jury. It was structured so that the information could be tabulated for analysis. The survey instrument was submitted to the Internal Clearance Committee, Research Bureau, United States Office of Education and was approved without revisions on April 16, 1968.

The survey of the public school districts. The survey instrument was mailed to a stratified random sample of public schools in the United States. The school districts were stratified into eight strata according to enrollment. Those with enrollments of less than 300 pupils were not

included because (1) information on these districts would be difficult to acquire, and (2) it was unlikely that schools of this size would be utilizing central warehousing procedures.

The final recommendations. The findings were reported in tabular form. From this data, one model was developed for use by large school districts and one model for use by small districts.

The two models were developed on the basis of the criteria that has been developed in this study. A partial list of the categories that were included in the models are listed below:

1. A functional organizational chart which indicated lines of authority and the function of each operating unit.
2. A flow chart for materials and documents.
3. A list of equipment and materials for warehouse operation.
4. An assignment and training program for warehouse personnel.
5. A formula to determine current and future warehouse size according to student population of the school district.
6. A space utilization layout within the warehouse, and
7. A design for utilization of electromechanical equipment in acquiring, storing, and distributing materials.

## REVIEW OF LITERATURE

The purpose of this section was to present a review of the literature and to develop tentative criteria pertinent to central warehousing procedures in public school districts.

Standard research sources were searched for data about central warehousing procedures. References such as the Encyclopedia of Educational

Research, Education Index, Dissertation Abstracts, and Research Studies in Education were reviewed. Textbooks in the area of public school administration, public school business administration, and school plant planning were also utilized. Journals, surveys, and yearbooks of professional organizations, such as the Association of School Business Officials, were studied.

Pre-World War II literature. Warehousing began in this country early in the 17th century, but was not commonly employed by school districts until the late 1800's. Public school warehousing from its beginning was closely allied with the business administration division of the school district.

The business and education functions were organized as separate divisions in most of the early school districts, and continued in this manner until the latter quarter of the 19th century. The business manager possessed almost complete authority over school district business matters during this same period and continued to exercise great responsibility up to the present. Later the election of superintendents to head the administrative functions of the school district somewhat diminished the absolute power of the business manager.

The need for storage developed slowly over the years as the school districts increased in size and enrollment. From 1890 to 1920 the ideas of Pestalozzi, Dewey, and James stimulated a new approach to education. The new concept of learning by doing required more classroom space and created a need for new kinds of storage facilities to house the voluminous amount of materials used by staff and pupils.

In a study conducted in 1926, Taylor found that about half of the twenty-five school districts studied utilized centralized storage procedures. All of the schools studied were located along the east coast of the United States. School districts not employing centralized warehousing procedures for storage purposes were ordinarily utilizing storage rooms in individual school buildings.

The concept that physical facilities developed out of the educational program they served was gaining favor each year in the minds of educators, boards of education, and architects. Further, it was more generally conceded that to employ staff to teach and then to fail to provide adequate facilities and materials was false economy.

Industry developed a more efficient business structure than did education. Therefore, organizational patterns developed in industry were employed by school districts in the late 1800's. The line and staff pattern or organization was most commonly employed by school districts.

The amount of storage space and its location seemed to vary according to the size of the school district. Small school districts usually provided storage facilities in individual school buildings while the large districts provided some storage space in each building and also maintained a central warehouse. A study conducted by the U. S. Office of Education found that storage facilities in individual school buildings were usually inadequate.

Large school districts were credited with more efficient warehousing procedures than the smaller school districts. Procedures such as inventory control, receiving, storing and delivery were usually more efficient in the large school districts.

Post-World War II literature. The post-World War II era was characterized by the growth in size of most school districts. Increasing amounts of money were being spent to provide supplies and materials for the continued influx of students. The educational goals and philosophy of the people had changed drastically since the first quarter of the century. Storage space during this period was considered a necessity rather than a luxury. Most large school districts found that central warehouses provided the most economical solution to school supply problems.

Centralization of storage facilities was fostered by a desire for better service and more effective regulation. The many technical advances in communication and transportation had simplified most of the previous centralization problems. Centralization of storage facilities was enabling school personnel to provide better service with fewer personnel.

During the period immediately following World War II, school districts began to employ qualified personnel for their warehouses. Persons with skill were sought for employment and were being reimbursed according to their skill. It was no longer believed that just anyone was capable of working in a warehouse.

Prompt and efficient processing of materials and supplies was considered an important function of centralized warehousing. Definite procedures were established for warehouse personnel to receive, store amd disburse supplies and materials. Long range planning and close supervision of daily activities were utilized to promote better warehouse efficiency. Utilization of a stock locator system enabled warehouse personnel to select stock for shipment and to utilize all available warehouse space to better advantage.

Security, housekeeping, and fire protection practices were commonly utilized in central warehouses to protect life and property. The extent to which these measures were employed seemed to vary according to the size of the school district. Pilferage of supplies was recognized as a major problem that had no easy solution.

Machine accounting was easily adapted to many of the business functions commonly performed in central warehouses. It was found to be more accurate and flexible than hand operated systems. Grieder found that school systems with more than one hundred employees were large enough to install machine accounting equipment. Mechanization of warehouse accounting also was found to be more economical and rapid.

A major objective of warehouse planning was to utilize all available storage space to the maximum. This was accomplished by fully utilizing all of the cubic storage space in the warehouse. Knowledge of commodity and capacity factors was considered crucial in accomplishing this goal.

Storage methods and procedures varied according to the amount and type of space, labor, equipment and supplies that were stored. Materials with a high turnover rate were stored in more convenient areas than the slower moving items. Supplies were rotated while in storage on the general principle of first in, first out. Storage aids were utilized by warehousemen to facilitate the handling of supplies.

The success of the warehousing operation was somewhat impaired by the lack of proper materials handling equipment. Consideration was given to characteristics of the storage area prior to final selection of the equipment. Materials handling equipment was usually grouped into three

categories. The categories were: (1) mobile and fixed equipment, (2) mobile equipment, and (3) fixed equipment.

It was generally felt that the central warehouse should be located near the geographic center of the school district. It was further believed that the warehouse should be located near a railroad or major highway and close to the main offices of the school district.

Most modern warehouses were found to be one-level structures. Consideration was usually given to future expansion in the acquisition of the site and in designing the building.

Warehouse size was formulated by studying school district needs and requirements. Henry Linn questioned whether a formula existed to determine warehouse size.

## FINDINGS

The purpose of this section was to report the jury response to the tentative criteria, and to present the findings relative to centralized warehousing procedures in public school districts.

This section was divided into two parts:

1. Jury responses to tentative criteria. The first part was included to present the jury response to the tentative criteria. The validation of the tentative criteria was based upon the judgment of eighteen jurors. A criteria statement met the standard for validation when at least three times as many jurors agreed with the statement as disagreed.
2. Centralized warehousing procedures in public school districts. The second part was included to present

centralized warehousing practices in public school districts as determined by the survey instrument which listed criteria validated by the jury.

## I. JURY RESPONSES TO TENTATIVE CRITERIA

The survey instrument was divided into four main areas: (1) Warehouse Staff, (2) Administration of the Warehouse, (3) Operation of the Warehouse, and (4) Planning a Warehouse. Each of the areas was subdivided for organizational purposes.

The following criteria met the standard for validation:

### A. WAREHOUSE STAFF

<u>Responsibilities of the Warehouse Staff</u>

1. An adequate supply of competent warehouse personnel should be available for the efficient operation of the warehouse.

2. The warehouse administration should screen and interview all warehouse personnel before employment.

3. The warehouse should be inspected periodically by school district business officials to determine whether good warehousing procedures are being followed.

4. A functional organizational chart indicating lines of authority and operating procedures should be part of warehouse administration.

5. Production standards should be determined for each warehouse staff position.

6. Bi-weekly staff conferences should be held to plan and coordinate warehousing activities.

7. The job descriptions for warehouse personnel should specify working hours and specific services required by the school district.

8. The warehouse manager should report directly to the Assistant Superintendent of Business Affairs.

9. The faculty and business officials should confer jointly to establish standards for supplies and equipment.

10. There should be an in-service on the job training program for the warehouse staff.

11. The warehouse staff should be carefully trained in safety procedures and accident prevention.

## B. ADMINISTRATION OF THE WAREHOUSE

### Warehouse Receiving Procedures

1. The receiving operation should be performed in an area that has been designated for that purpose only.

2. Incoming materials and supplies should be ehecked and labled before being stored.

3. Traffic functions such as receipts, freight bills, and damage claims should be examined and verified at the receiving station.

4. Tally-in procedures at the receiving station should include: (1) comparision of vendor's invoice with the purchase order, (2) comparison of vendor's invoice with the materials received, (3) examination of materials received, (4) updating warehouse records, and (5) assignment of materials to the proper storage areas.

5. Incoming materials should be unloaded directly onto the floor of the receiving area with a minimum of handling.

6. Warehouse administrator should be notified in advance of all inbound shipments to insure proper utilization of storage space.

### Warehouse Delivery Procedures

1. The requisition form is the proper instrument for initiating the selection, packing, and shipping of a warehouse item.

2. The issuance of warehouse supplies without receipt of a properly authorized requisition should be forbidden.

3. The warehouse delivery man should transport the materials to the individual school unloading dock and the school custodians should handle the materials from that point.

4. The vendors should charge more for delivery to several points than to a central location.

5. The disbursement of stock will show definite patterns which will aid in placing future orders for replenishing stores.

6. The delivery schedule for perishables should be planned on an "as needed basis" or on a daily basis.

7. The time lag between receipt of the requisition and delivery to the school should not exceed twelve days.

8. The timing of purchases to avoid large orders during the vendors busy season will permit prompt deliveries and minimize back orders.

9. Outbound shipments should be properly packaged, and marked before leaving the warehouse.

10. Adequate materials should be readily available in the warehouse delivery area for packaging and reshipment of materials.

11. The school supply allotment should be based upon a set unit determined according to the type of school.

12. The delivery of supplies should not be made without specific funds available for the school as listed in the controller's records.

13. The regular delivery routes should be carefully established. There is a fixed day and approximate time of delivery for each school.

Stock Locator Procedures

1. The location of all warehouse items should be familiar to warehouse personnel.

2. The warehouse records should show the purchase date and cost of all items stored.

3. The office equipment needed for stock location should include bookkeeping machines, desks, chairs, filing cabinets, inventory control card files, and data processing equipment.

4. The warehouse items should be listed by number in the supply catalogue.

5. The use of a supply catalogue when ordering materials from the warehouse will save time and eliminate errors.

6. The warehouse catalogue which contains stock numbers, descriptions and prices should be furnished to every school in the district.

7. The stock locator system should provide an accurate description and uniform interpretation which will enable warehouse personnel to locate materials in the warehouse.

8. The warehouse catalogue should simplify order filling through the use of uniform descriptions and by informing teachers of the items available.

9. Stored materials should be clearly marked for easy identification and should be easily located by means of the locator file.

10. The stock record cards should carry a description of an item, its location, vendor, date, unit price, purchase order file number, requisition number, and all returns of materials.

11. The warehouse locator system should be similar to the pattern of streets and avenues of a city.

12. A diagramatic plan of the warehouse layout should be available to all warehouse employees.

Warehouse Inventory Procedures

1. The basis of stock control should be accurate records.

2. The stock issue record should list a chronological record of receipts, issues and balances on hand for each stock item.

3. The historical record should contain a record of merchandise ordered, the quantity due in, and the estimated lead time.

4. The historical record should contain information needed for determining when and how much to purchase.

5. The economic order quantity should be an orderly way of determining how much and how frequently to buy.

6. The perpetual inventory as well as the annual physical inventory should be taken to control stock.

7. The freezing of stock should be a satisfactory method for accurate inventory and the stock can be checked with the perpetual inventory records to solve special problems.

8. Hand posting of warehouse records is slow and often inaccurate which should indicate its lack of practicability in modern warehouses.

9. The school staff should be notified two weeks in advance that the warehouse will be closed for inventory.

10. A maximim and minimum order quantity should be established for each item in storage.

Warehouse Security Procedures

1. Warehouse insurances that should be investigated by the warehouse manager are fire, wind, hail, earthquake, burglary, liability and sprinkler.

2. Fire extinguishers should be installed at key places to protect against fire.

3. A security area for valuables should be an important part of a warehouse.

Machine Accounting Problems

1. Accounting and bookkeeping machines should easily adapt to the posting operations performed in central warehouses.

2. Overstructured requisitioning, recording and reporting may cause frustration so that employees will misuse the process.

3. A perpetual inventory should be accomplished by means of data processing equipment.

4. Schools should not be permitted to spend over their budget allowances.

5. The inventory record should be reduced immediately after materials are withdrawn.

6. Accepted accounting practice should require that payment not be made until a responsible person okays the delivered goods.

## C. OPERATION OF THE WAREHOUSE

1. Wall space should be utilized for storage of awkward shaped items.

2. Pallets should be arranged back to back when laying out floor space for small or mixed lots.

3. When laying out warehouse floor space, large areas should be reserved for quantity lots of similar items.

4. Approximately sixty per cent of the warehouse floor space should be allocated to bulk storage.

5. Approximately forty per cent of floor space should be utilized for bin storage and small lot items.

6. Office space should be an integral part of the warehouse.

7. Space allocations should be determined by the materials to be handled.

8. An important objective of warehouse utilization should be the maximum use of floor and vertical space.

9. Floor space utilized for pallets should be marked so the area can be numbered.

10. Painted lines or tape should be used to lay out the floor space.

11. Cross aisles should be a minimum of ten feet wide if mechanized equipment is utilized.

12. Each bin section and opening should have its own number.

13. Efficient bin storage should allow a man to pick items without use of a ladder with the bin a maximum height of seven feet high and three feet wide.

14. Bin storage should be approximately twelve inches high by twenty-four inches deep and thirty-five inches wide.

15. Cubic and square footage should be a good guage of available storage space.

16. Approximately one-third of the warehouse floor space should be required for access aisles.

Warehouse Storage Methods

1. Warehouse structures may vary in size but usually the same basic principles of warehouse arrangement and management will apply.

2. Items which are difficult to store should be located close to an exit.

3. Flammable materials should be separated from other warehouse materials and stored near an exit.

4. Air space in storage stacks should be desirable in humid climates and where insects or rodent control is important.

5. Conveyors should be used in warehouses for efficiency and economy.

6. High stacking of materials should provide additional floor space, reduce handling costs, and improve housekeeping.

7. The spacing, height, and arrangement of racks should be determined by the items stored.

8. Temperature should be regulated in most parts of the warehouse.

9. Arrangement of materials should allow for the use of old stock first.

10. Materials with a high turnover rate should be stored in more convenient locations while the slow moving items should be stored in less accessible areas.

Warehouse Materials Handling Equipment

1. Proper equipment should permit economical warehouse operation.

2. Purchase and maintenance records should be kept of all warehouse equipment.

3. Less manual labor should be required when more mechanized equipment is utilized.

4. Commodities should be handled by use of a two way entry pallet.

5. The box pallet should be used for crushable items or materials that do not stack well.

6. Fork lifts should allow use of high shelving and increase vertical storage space.

7. Trucks should be utilized for transporting supplies to individual schools from the warehouse.

8. Materials handling equipment should be centrally controlled for maximum utilization.

9. All materials handling equipment should be inspected and carefully maintained on a regular schedule.

## D. PLANNING A WAREHOUSE

Warehouse Planning

1. When establishing a central warehouse the following factors should be considered: (1) site size, (2) central location, (3) access to railroad facilities, (4) availability of motor freight services.

2. Remodeling a building that was not constructed as a warehouse may be costly and unsatisfactory for storage purposes.

3. Systems that are necessary to a modern warehouse include: (1) electrical, (2) sprinkler, (3) heating, (4) ventilating, (5) burglar alarm, (6) air conditioning, (7) telephone, and (8) intercom.

4. The warehouse should be located in an area in which police and fire protection is readily available.

5. Provision should be made for expansion of the warehouse as storage needs increase.

6. All new warehouses should be of the one level type construction.

7. Warehouse floors should be constructed of cement.

8. A central warehouse should be constructed whenever a school district has six or more buildings located on different sites.

## II. SCHOOL DISTRICT RESPONSES TO VALIDATED CRITERIA

The public school district survey instrument contained criteria validated by the eighteen jury members and was divided into five areas: (1) warehouse staff, (2) administration of the warehouse, (3) operation of the warehouse, (4) planning a warehouse, and (5) general information.

Three hundred twenty-one survey instruments were returned. These represented 77.2 per cent of the originally selected school districts. Nine school districts in stratum eight that originally qualified as participants for this study returned their survey instruments unanswered. The nine school districts also submitted letters indicating the reason they were unable to participate. The reason given, in all instances, was that they did not have a central warehouse.

An attempt was made to draw comparisons between the eight strata surveyed in this study. After analyzing the data it was not possible to compare schools on the basis of strata.

The responses to the school district survey instrument was reported in tabular form. Responses were recorded on the tables according to strata. Criteria followed by sixty per cent or more of the school

districts were recorded on Table XL which is located in Appendix A.

Observations of Table XL indicated that eight of the criteria involving responsibilities of the warehouse staff were followed by sixty per cent or more of the participating schools in stratas one through seven. Thirty-three criteria involving administration of the warehouse were followed by sixty per cent or more of the participating schools in strata one through seven. Twenty criteria relating to operation of the warehouse were followed by sixty per cent or more of the participating school districts in strata one through seven. Five criteria involving the planning of a warehouse were followed by sixty per cent or more of the school districts in strata one through seven.

A wide range existed in the amount of money spent by participating school districts. Over sixty per cent of the school districts reported spending between $400,000 and under $100,000.

The square feet of storage space varied rather widely. School districts reported storage space ranging from 2,000 to 14,999 square feet.

Sixty per cent or more of the school districts reported employing from one to five persons on the warehouse ataff. Larger school districts reported a larger number of employees than smaller districts.

The time lag between receipt of the requisition at the warehouse and delivery of materials was reported to be seven days or less by sixty per cent or more of the participating schools. Thirty-six schools reported a time lag of only one day between receipt of the requisition and delivery.

Cardex equipment was used by approximately one-third of the participating school districts in their warehouse record keeping operations. I.B.M. was the second most popular record keeping equipment being employed by approximately one-fourth of the school districts in this study.

Cement was the most commonly used material in construction of warehouse floors and walls. About one-half of the participating school districts used it in floors and about three-fourths used it in walls. Tar and gravel were reported by approximately one-third of the participating school districts as roof materials.

Fork lifts, dollies, and hand trucks were utilized by more of the school districts in strata one through seven. Conveyors, pallet jacks, hoists, and lift gates were also reported by the participating school districts.

## CONCLUSIONS

Certain conclusions seem justified in the light of (a) the results of the review of literature, (b) the verification work performed by the jury, and (c) the comparison of the criteria developed in the study with actual practice in the field.

Conclusions from the literature. After a slow beginning, the use of central warehousing as standard practice among the public school districts in this country became, one may conclude, principally a function of district size. That is, the larger a school district became, either through population growth or, more recently, the consolidation of smaller districts into larger ones, the greater became the need for central warehousing. This conclusion is further supported in later portions of the

study, where it was revealed that smaller school districts in this country ordinarily have either decentralized storage and dissemination of school supplies, or, as in some districts, no warehousing facilities at all. Conversely, the fact that a majority of the larger school districts tended in practice to provide central warehousing showed the conclusion to be sound.

Another conclusion first suspected from the literature that school central warehousing,being a product of industrial adaptation, might continue to follow industrial warehousing patterns, was also borne out. The planning of central warehousing facilities, the employment of staff, and the administration and operation of the facilities were all influenced largely by what went on simultaneously in the industrial plants and government storage depots of the nation. As these industrial and governmental warehousing practices prospered and waned, so did warehousing in the public schools. The present high status of school district warehousing, one may conclude, is therefore due in large part to the adaptation of the industrial know-how developed in industry and government to the problems of rapidly growing school districts in the United States.

Conclusions from the normative phase. The most important conclusion to be gleaned from the normative phase of the study is that central warehousing is rapidly becoming a science. A pattern of planning, organization, operation and evaluation of the warehouse function is being developed. Thus, eventually it may be possible in practice to approach the ideal of warehousing, which is to assure that the warehousing system serves man rather than the reverse.

Other conclusions seem justified. The scope of the school business official's responsibilities have widened considerably, and in this respect,

central warhousing is no exception. Management methods proved in industry and the government are finding wide acceptance in the school business field, and innovations in supply of materiel are being displayed. There is serious consideration of raising the manager's role to professional status, although there is still division of thought on this point. Greater controls over the materiel function are possible through standardization of both process and procedure. In many ways, management of the warehousing function is a team management affair.

There is increased activity in the desire to synchronize the warehousing function with the budgetary cycle. Machine accounting has become almost standard practice in school districts of any size. Considerable sophistication has been developed in the arrangement of the physical warehouse itself, in methods of receiving, storing and distributing goods, and in the keeping of a serviceable inventory.

As school districts continue to grow, both the budgeting and warehousing functions will be challenged to reflect more clearly and accurately the true efficacy of the educational program. Such innovations as program budgeting, the use of computers to make educational decisions, and the increased use of automation in warehousing will bring much needed change to this field in the latter third of the twentieth century.

Conclusions from the status phase. Finally, some conclusions seem justified from the status phase of the study. The most important of these is the conclusion that, despite the fact that central warehousing among American school districts is a function of size, no significant differences were discernible between or among the eight size strata established in the study. That is, the wide range of practice

among the school districts in the study sample with regard to warehousing practices made it impossible to draw the line as to what constitutes a "large" district and what constitutes a "small" district for purposes of the study.

Nevertheless, in the development of the sample models, a discernible difference could be detected between the group in strata one through four, and those making up the smaller districts in the strata five through seven. It was on this basis that the models recommended for use by the various districts were developed.

In this connection, there is an inescapable conclusion that there is less likelihood that congruency will be found between theory and practice in the small school warehouse than in the large school warehouse. Again, warehousing seems to be a function of size, although the point at which a school district become "large" was not determined in the study.

The extent to which theory and practice coincided (Table XL, Appendix A) led to the conclusion that there is general awareness of the need to institute more acceptable practices into warehousing, although not all districts were in a position to put these into practice should they be discovered. One may safely conclude, therefore, that there is a pressing need for sound basic research in the area of school warehousing. The responses of the business officials indicating their interest in the outcomes from the study is indicative of the interest in newer innovations and in finding ways to solve knotty problems in the school districts of the nation.

One problem, of course, is that of the singular uniqueness of each school district in the country. What may be acceptable practice

in one district may not of necessity be good practice in another. Further studies related to the unique qualities of each school district, and how each factor (sparsity, distance from source of supply, demography of the district, etc.) should be undertaken to alleviate this need.

## RECOMMENDATIONS

Based on the findings, conclusions and insights gained in the conduct of the study, it is recommended that the following models (see Appendix B) be utilized by school officials seeking to upgrade their warehousing practices. Model I is for use by districts of the size included in strata one through four, while Model II was developed for use by the smaller districts included in strata five through seven in the study.

The complete report of the study should be consulted for more detail in the operational aspects of these models.

# APPENDIX A

TABLE XL

PERCENTAGE SUMMARY OF AFFIRMATIVE RESPONSES TO CRITERIA PRACTICED BY MORE THAN SIXTY PER CENT OF THE 321 SCHOOL DISTRICTS

| Criteria | Per Cent |
|---|---|
| **Staff Responsibilities** | |
| 1. An adequate supply of competent warehouse personnel is available for the efficient operation of the warehouse. | 69% |
| 2. Regular custodial service is provided to keep the building neat and clean. | 71% |
| 3. The warehouse administrator performs clerical details. | 65% |
| 4. The warehouse administration screens and interviews all warehouse personnel before employment. | 61% |
| 5. The warehouse is inspected periodically by school district business officials to determine whether good warehousing procedures are being followed. | 79% |
| 6. Job descriptions for warehouse personnel specify working hours and specific services required by the school district. | 68% |
| 7. Faculty and business officials confer jointly to establish standards for supplies and equipment. | 83% |
| 8. The warehouse staff is carefully trained in safety procedures and accident prevention. | 63% |

TABLE XL (Continued)

| Criteria | Per Cent |
|---|---|
| **Receiving Procedures** | |
| 1. The receiving operation is performed in an area that has been designed for only this purpose. | 74% |
| 2. Incoming materials and supplies are checked and labeled before being stored. | 88% |
| 3. Traffic functions such as receipts, freight bills and damage claims are examined and verified at the receiving station. | 92% |
| 4. The check in procedures at the receiving station include: (1) comparison of vendor's invoice with purchase order, (2) comparison of vendor's invoice with materials received, (3) examination of materials received, (4) updating warehouse records and (5) assignment of materials to the proper storage areas. | 75% |
| 5. The incoming materials are unloaded directly onto the floor of the receiving area with a minimum of handling. | 83% |
| **Delivery Procedures** | |
| 1. The requisition form is the proper instrument for initiating the picking, packing and shipping of warehouse items. | 81% |
| 2. The issuance of warehouse supplies without receipt of a properly authorized requisition is forbidden. | 81% |

TABLE XL (Continued)

| Criteria | Per Cent |
|---|---|
| 3. The warehouse delivery man transported the materials to the school unloading dock and then the school custodians handled the materials from this point. | 73% |
| 4. The vendors charged more for delivery to several points than to a central location. | 73% |
| 5. The delivery schedule for materials called for deliveries to each school at least once every two weeks. | 72% |
| 6. The disbursement of stock showed definite patterns which aided in placing future orders for replenishing stores. | 82% |
| 7. The delivery schedule for perishables was planned for either as needed or daily. | 81% |
| 8. The timing of purchases to avoid large orders during the vendor's busy season permitted prompt deliveries and minimized back orders. | 75% |
| 9. Outbound shipments were properly packaged, and marked before leaving the warehouse. | 90% |
| 10. Adequate materials were readily available in the warehouse delivery area for packaging and reshipment of materials. | 76% |
| 11. The regular delivery routes were carefully established with each school knowing the day and approximate time of delivery. | 66% |

TABLE XL (Continued)

| Criteria | Per Cent |
|---|---|
| **Stock Locator Procedures** | |
| 1. The location of all warehouse items was familiar to warehouse personnel. | 90% |
| 2. The use of a supply catalogue when ordering materials from the warehouse saved time and eliminated errors. | 68% |
| 3. The warehouse catalogue which contained stock numbers, descriptions and prices was furnished to every school in the district. | 67% |
| 4. The stock locator system provided an accurate description and uniform interpretation which enabled warehouse personnel to locate materials in the warehouse. | 62% |
| 5. The warehouse catalogue simplified order filling through the use of uniform descriptions and by furnishing teachers knowledge of items available. | 67% |
| **Inventory Procedures** | |
| 1. The basis of stock control was an accurate set of records. | 70% |
| 2. The stock issue record listed a chronological record of receipts, issues, and balances on hand for each stock item. | 65% |
| 3. The historical records contained information needed for determining when and how much to purchase. | 66% |

TABLE XL (Continued)

| Criteria | Per Cent |
|---|---|
| 4. The purchasing of a year's supply of materials for the school staff was desirable. | 68% |
| 5. The perpetual inventory as well as the annual physical inventory was taken to control stock. | 80% |
| 6. The freezing of stock was a satisfactory method for accurate inventory and the stock was checked with the perpetual inventory records to solve special problems. | 69% |
| 7. Control of the amount that a school was permitted to spend was determined by school apportionment based upon average daily attendance. | 60% |
| **Security Procedures** | |
| 1. Fire, wind, hail, earthquake, burglary, liability and sprinkler insurance was carried on the warehouse. | 79% |
| 2. Fire extinguishers were installed at key places to protect against fire. | 91% |
| **Machine Accounting** | |
| 1. Inventory records were reduced immediately after materials were withdrawn. | 69% |
| 2. The allocation of materials was figured on a per pupil basis. | 63% |
| 3. It was required that payment not be made until a responsible person okayed the delivered goods. | 90% |

TABLE XL (Continued)

| Criteria | Per Cent |
|---|---|
| **Space Utilization** | |
| 1. Wall space was utilized for storage of awkward shaped items. | 84% |
| 2. Pallets were arranged back to back when laying out floor space for small or mixed lots. | 63% |
| 3. When laying out warehouse floor space large areas were reserved for quantity lots of similar items. | 79% |
| 4. Approximately sixty per cent of the warehouse floor space was allocated to bulk storage. | 67% |
| 5. Approximately forty per cent of floor space was utilized for bin storage and small lot items. | 64% |
| 6. Office space was an integral part of the warehouse. | 62% |
| 7. Space allocations were determined by the materials to be handled. | 83% |
| 8. An important objective of warehousing was utilization of the maximum use of floor and vertical space. | 90% |
| 9. Bin storage allowed a man to pick items without use of a ladder with the bin a maximum of seven feet high and three feet wide. | 60% |

TABLE XL (Continued)

| Criteria | Per Cent |
|---|---|
| 10. Cubic and square footage was a good gauge of available storage space. | 75% |
| **Storage Methods** | |
| 1. The same basic principles of warehouse arrangement and management applied even though the warehouse structures may vary in size. | 70% |
| 2. Pallets holding similar items were stacked back to back with the pallet front facing an aisle for easy accessibility. | 61% |
| 3. Items which were difficult to store were located next to an exit. | 62% |
| 4. Flammable items were separated from other warehouse materials and stored near an exit. | 77% |
| 5. Air space existed in storage stacks. | 86% |
| 6. High stacking provided additional floor space, reduced handling costs and improved housekeeping. | 75% |
| 7. The spacing, height and arrangement of racks was determined by the items stored. | 85% |
| 8. The arrangement of materials allowed for the use of old stock first. | 88% |
| 9. Materials with a high turnover rate were stored in more convenient locations while the slow moving items were stored in less accessible areas. | 82% |

TABLE XL (Continued)

| Criteria | Per Cent |
|---|---|
| **Materials Handling Equipment** | |
| 1. Proper equipment permitted economical warehouse operation. | 75% |
| 2. Purchase and maintenance records were kept on all warehouse equipment. | 69% |
| 3. Less manual labor was required when more mechanized equipment was utilized. | 78% |
| 4. Trucks were utilized for transporting supplies to individual schools from the warehouse. | 94% |
| 5. Materials handling equipment was centrally located for maximum utilization. | 77% |
| 6. All materials handling equipment was inspected and carefully maintained on a regular schedule. | 72% |
| **Planning A Warehouse** | |
| 1. The warehouse was located in an area in which police and fire protection was readily available. | 96% |
| 2. The warehouse is of the one level type construction. | 75% |
| 3. The warehouse had cement floors. | 85% |
| 4. A central warehouse was constructed after the school district had six or more buildings located on different sites. | 61% |

# APPENDIX B

# III. MODELS

From the findings, conclusions, recommendations and insight gained in the present study, two central warehouse models were developed. Model I was developed for use by the larger school districts in strata one through four. Model II was developed for the smaller school districts in strata five through seven. No clearly discernable differences seemed to exist in the criteria practiced by the school districts, but two models were developed to reflect the size difference.

## MODEL I

### Organizational Chart

The model is divided into seven sections. Section one contains a functional organizational chart which indicates lines of authority of the central warehouse staff. A short explanation of each function is also given on the chart. Figure IV, located on the following page, illustrates the proposed lines of authority and functions.

### Flow Chart

Section two of Model I contains a flow chart for materials and documents. Figure V illustrates the proposed flow chart for materials and documents.

### Equipment and Materials

Section three of Model I lists the equipment and materials required for central warehouse operation. The list is recorded in Table XLI.

FIGURE IV

A FUNCTIONAL ORGANIZATIONAL CHART FOR CENTRAL WAREHOUSE STAFFS OF LARGE SCHOOL DISTRICTS

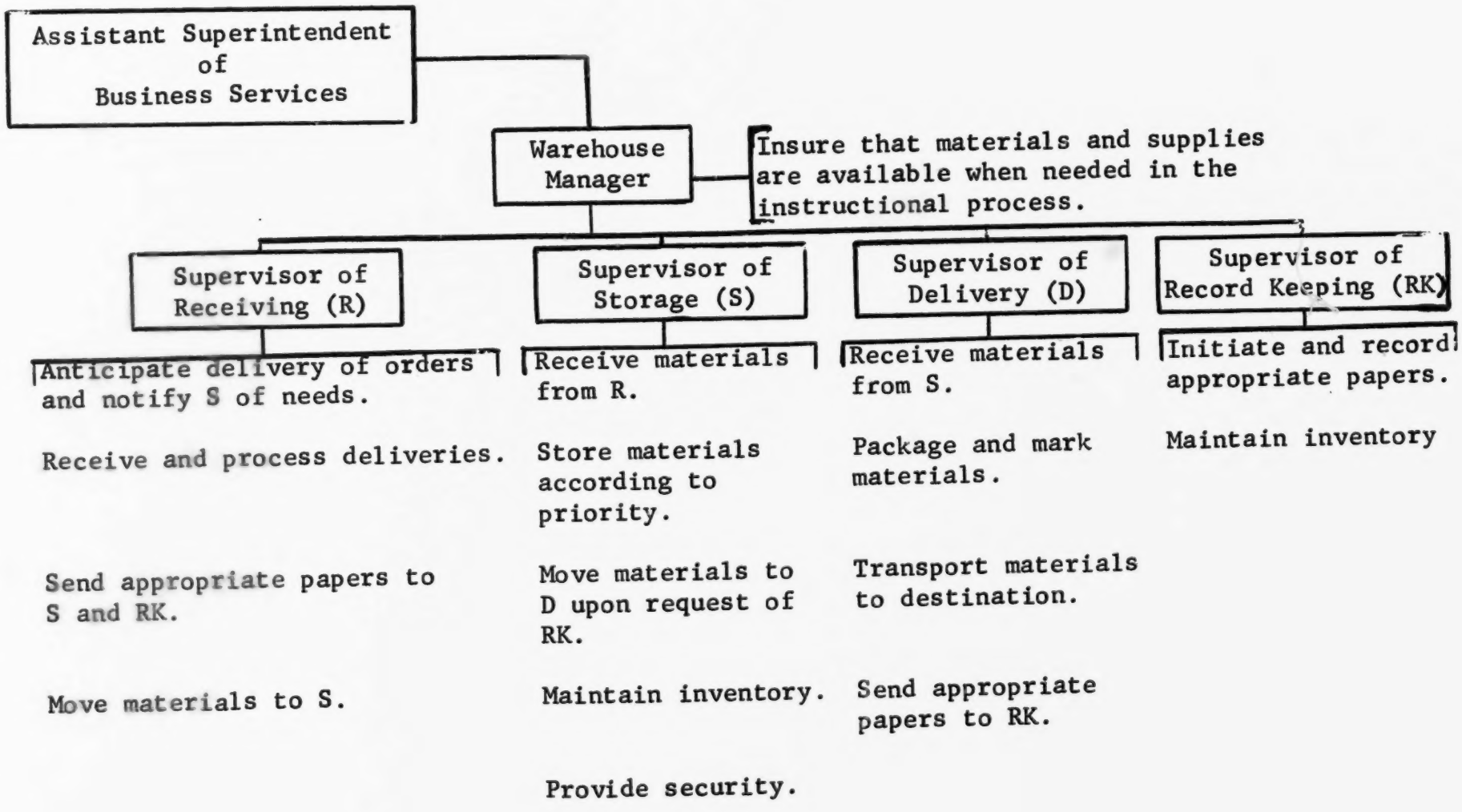
Assistant Superintendent of Business Services
Warehouse Manager
Insure that materials and supplies are available when needed in the instructional process.
Supervisor of Receiving (R)
Supervisor of Storage (S)
Supervisor of Delivery (D)
Supervisor of Record Keeping (RK)
PRIMARY FUNCTIONS
Anticipate delivery of orders and notify S of needs.
Receive and process deliveries.
Send appropriate papers to S and RK.
Move materials to S.
Receive materials from R.
Store materials according to priority.
Move materials to D upon request of RK.
Maintain inventory.
Provide security.
Receive materials from S.
Package and mark materials.
Transport materials to destination.
Send appropriate papers to RK.
Initiate and record appropriate papers.
Maintain inventory

FIGURE V

A FLOW CHART FOR CENTRAL WAREHOUSE
MATERIALS AND DOCUMENTS

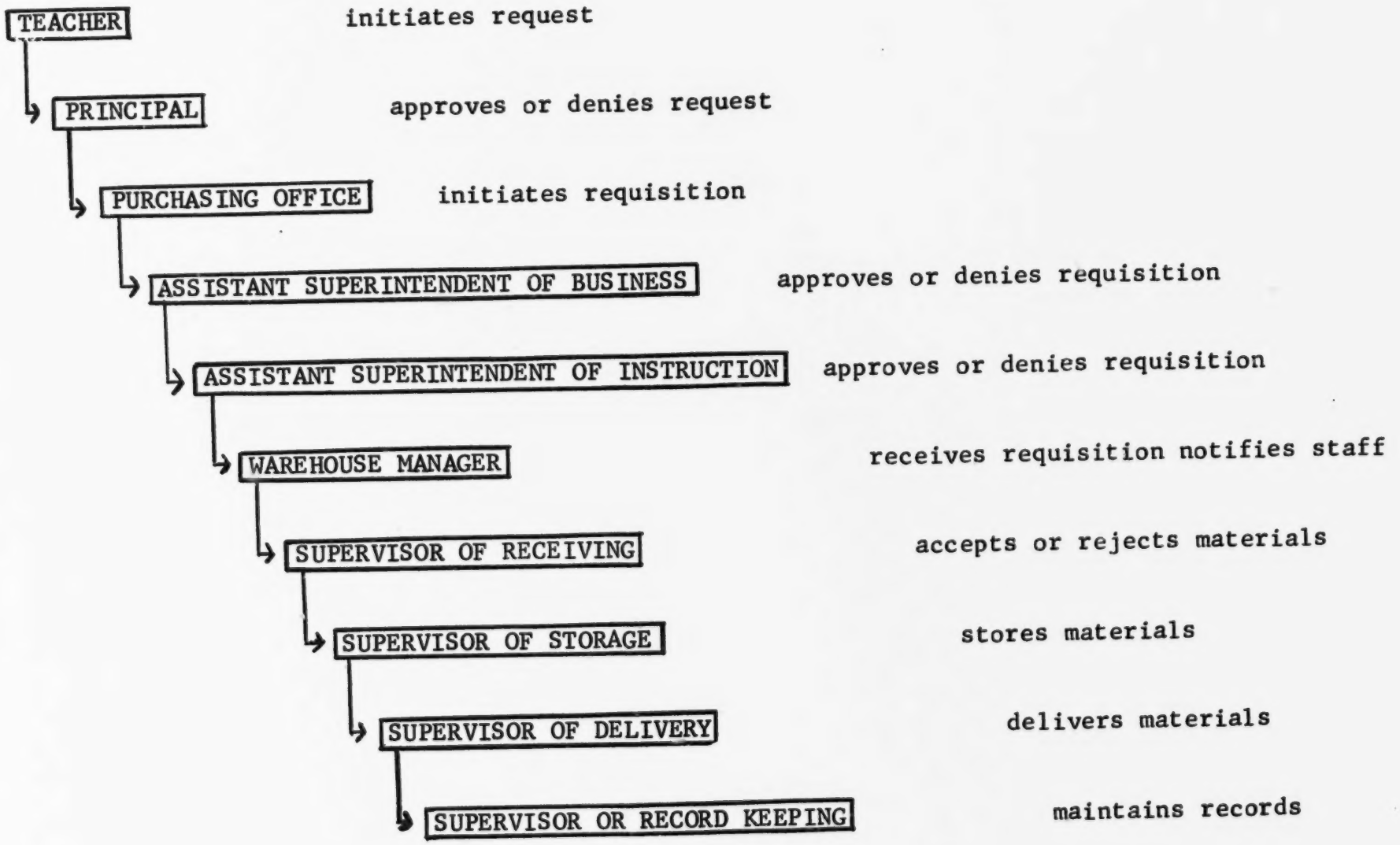

TABLE XLI

A LIST OF EQUIPMENT AND MATERIALS FOR WAREHOUSE OPERATION

| Type of Equipment and Materials | Minimum Number |
|---|---|
| **Warehouse Mobile Equipment** | |
| Motor trucks and trailers | 1 |
| Fork lift trucks | 2 |
| Industrial tractor and trailers | 1 |
| Pallet trucks | 1 |
| Four wheeled hand carts | 2 |
| Two wheeled hand carts | 2 |
| Dollies | 6 |
| Pallet jacks | 1 |
| **Warehouse Fixed Equipment** | |
| Cranes | 1 |
| Conveyors (floor embedded or overhead type) | 1 |
| Pneumatic systems | 1 |
| Chutes | 1 |
| Hoists | 1 |

TABLE XLI (Continued)

| Type of Equipment and Materials | Minimum Number |
|---|---|
| **Warehouse Record Keeping Equipment** | |
| Key punch | 2 |
| Verifier | 1 |
| Sorter | 1 |
| Accounting machine | 1 |
| Reproducing summary punch | 1 |
| Collator | 1 |
| Interpretor | 1 |
| Calculator | 4 |
| Electronic computer | 1 (or access to one) |
| Data processing cards | unlimited |
| Requisition forms | unlimited |

Assignment and Training Program

Section four of Model I describes the assignment and training program for central warehouse personnel. This program is divided into two parts. The first part involves central warehouse safety practices. The purpose of the program is to protect the health and safety of warehouse employees and to prevent property loss. The warehouse manager is named as the person responsible for conduct and success of the program. He is empowered to delegate parts of the program to his subordinates.

The prime problem to be corrected is that of locating unsafe conditions and careless employee acts before accidents occur. The following safety statements are believed applicable to a warehouse safety program:

1. Utilize adequate personnel to perform the assigned mission of the warehouse.
2. Carefully assign personnel according to their capabilities.
3. Fully instruct each employee regarding his duty and the use of protective gear.
4. Demand high standards of warehouse maintenance and sanitation.
5. Employ warning and protective devices freely.
6. Utilize equipment only for its intended purpose.

The second part of the assignment and training program involves the improvement of workers' skills while on the job in the warehouse.

The purpose of the program is to promote job efficiency and eliminate confusion. The warehouse manager is responsible for the success and implementation of the program.

The training program involves both classroom activities and operational instruction. Instructors thoroughly familiar with warehousing procedures are utilized in the classroom. Supervisors from the warehouse or experts from industry are employed in the operational instruction. Audio-visual techniques are effective teacher aids.

The operational instruction is best conducted on an individual basis. It is found that the instructor must be thoroughly familiar with all aspects of his instructional program. Attention to detail by the instructor is demanded and appreciated by the student.

The following statements are applicable to this type of training program:

1. Convey the purpose for warehousing and the employee's importance to its success.
2. Fully explain every operation.
3. Emphasize good safety practices.
4. Demonstrate techniques whenever the occasion permits.
5. Provide in-service training for all employees regardless of their length of service.

Determination of Warehouse Size

Section five of Model I involves a formula to determine current and future warehouse size. It is hypothesized that storage space can

be determined on the basis of one square foot of storage space per enrolled student. Thirteen jury members agreed with the statement while five jurors disagreed. The statement therefore failed to become one of the study's criterion.

A second method to determine needed storage space was discovered during the course of the study. It was not submitted to a jury due to its discovery after the study was partially completed. This method computes storage space on the basis of one square foot of space for every ten dollars of materials purchased annually.

Space Utilization Layout

Section six of Model I involves a space utilization layout for the central warehouse. The following statements are considered significant.

1. Bulk storage is allocated sixty per cent of the warehouse storage space.
2. Small lot storage is allocated forty per cent of the warehouse storage space.
3. Awkward shaped items are stored along walls.
4. Bin storage does not exceed a maximum height of seven feet high and three feet wide.
5. Quantity lots of similar items are placed in the bulk storage area.

Utilization of Electromechanical Materials

Section seven of Model I involves a design for utilization of electromechanical equipment in acquiring, storing, and distributing materials. The various machines considered necessary for this operation were previously listed in part three of Table XLI and will not be repeated in this section. However, a summary of the operations of a punched card system applicable to public school warehousing is recorded below.

1. A master stock record card is keypunched with the following information.
   a. Item description and stock number.
   b. Unit of issue and quantity on hand.
   c. Unit price.
2. The receiving section acknowledges delivery and acceptance of materials and notifies the record keeping section.
3. The record keeping section keypunches a receipt card for each item of material delivered. The card indicates the stock number, quantity received, unit cost, and receiving notice number.
4. A detailed commodity issue card is keypunched for each stock item to be issued from warehouse stock to schools submitting requisitions.

5. The item issue cards contain the school number, quantity being requisitioned, item stock number, and account number.
6. The issue cards are then utilized to prepare packing lists which serve as authorization to distribute supplies and materials.
7. One copy of the packing list is signed, serving as a delivery acknowledgement, as the materials are delivered to the school.
8. The receipts and issue cards are merged with the master record cards to adjust the stock quantity on hand.
9. As the available supply of any item falls below the minimum order quantity a credit balance appears on the master stock record card.
10. The credit balance cards are then passed through a sorter and reproduced into a purchasing authorization card.
11. The issue cards representing items delivered to schools are reprocessed for the production of the monthly reports.
12. A stock status report is prepared from the master stock record cards for review of all stock items and purposes of inventory.

## MODEL II

### Organizational Chart

Section one of Model II contains a functional chart which indicates lines of authority of the central warehouse staff. A short explanation

of each function is given on the chart. Figure VI illustrates the proposed lines of authority and functions.

Flow Chart

Section two of Model II contains a flow chart for materials and documents. Figure VII illustrates the proposed flow chart for materials and documents.

Equipment and Materials

Section three of Model II lists the materials required for central warehouse operation. The list is recorded in Table XLII.

Assignment and Training Program

Section four of Model II describes the assignment and training program for central warehouse personnel. The program is composed of two parts: safety and the improvement of skills. The first part involves central warehouse safety practices. The purpose of the program is to protect the health and safety of warehouse employees and to prevent property loss. The warehouse manager is named as the person responsible for conduct and success of the program. He is empowered to delegate parts of the program to his subordinates.

The prime problem to be corrected is that of locating unsafe conditions and careless employee acts before accidents occur. The following safety statements are believed applicable to a warehouse safety program:

FIGURE VI

A FUNCTIONAL ORGANIZATIONAL CHART FOR CENTRAL WAREHOUSE STAFFS OF SMALL SCHOOL DISTRICTS

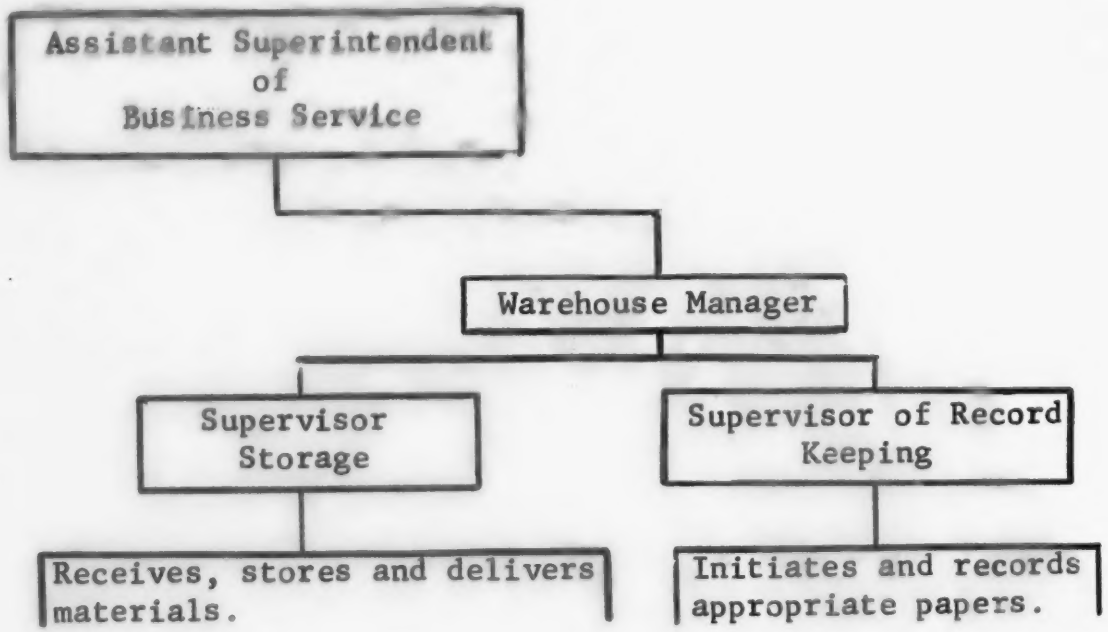

FIGURE VII

A FLOW CHART FOR CENTRAL WAREHOUSE
MATERIALS AND DOCUMENTS

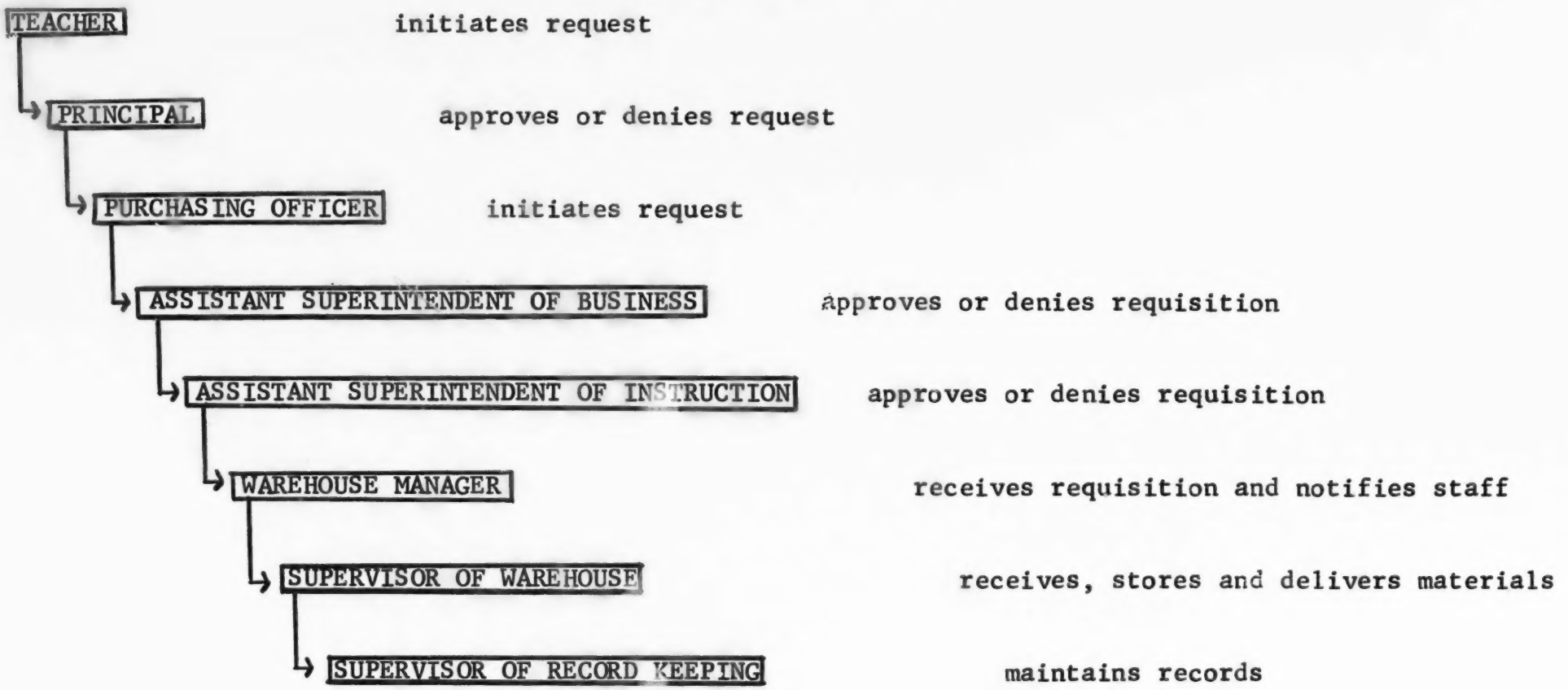

TABLE XLII

A LIST OF EQUIPMENT AND MATERIALS FOR WAREHOUSE OPERATION

| Type of Equipment and Materials | Minimum Number |
|---|---|
| **Warehouse Mobile Equipment** | |
| Truck | 1 |
| Forklift truck | 1 |
| Pallet truck | 1 |
| Four wheeled cart | 1 |
| Two wheeled cart | 2 |
| Dollies | 2 |
| Pallet jack | 1 |
| **Warehouse Fixed Equipment** | |
| Conveyor (floor embedded or overhead) | 1 |

TABLE XLII (Continued)

| Type of Equipment and Materials | Minimum Number |
|---|---|
| Warehouse Record Keeping Equipment | |
| Keypunch | 1 |
| Verifier | 1 |
| Data processing cards | unlimited |
| Requisition forms | unlimited |
| Calculator | 1 |

1. Utilize adequate personnel to perform the assigned mission of the warehouse.
2. Carefully assign personnel according to their capabilities.
3. Fully instruct each employee regarding his duty and the use of protective gear.
4. Demand high standards of warehouse maintenance and sanitation.
5. Employ warning and protective devices freely.
6. Utilize equipment only for its intended purpose.

The second part of the assignment and training program involves the improvement of workers' skills while on the job in the warehouse. The purpose of the program is to promote job efficiency and eliminate confusion. The warehouse manager is responsible for the success and implementation of the program.

The training program involves both classroom activities and operational instruction. Instructors thoroughly familiar with warehousing procedures are employed for classroom instruction. Supervisors from the warehouse or experts from industry are utilized in the operational instruction. Audio-visual techniques are found effective teacher aids.

The operational instruction is best conducted on an individual basis. It is found that the instructor must be thoroughly familiar with all aspects of his instructional program. Attention to detail by the instructor is demanded and appreciated by the student.

The following statements are applicable to this type of training program:

1. Convey the purpose for warehousing and the employee's importance to its success.
2. Fully explain every operation.
3. Emphasize good safety practices.
4. Demonstrate techniques whenever the occasion permits.
5. Provide in-service training for all employees regardless of their length of service.

Determination of Warehouse Size

Section five of Model II involves a formula to determine current and future warehouse size. It is hypothesized that storage space can be determined on the basis of one square foot of storage space per enrolled student. Thirteen jury members agreed with the statement while five jurors disagreed. The statement therefore failed to become one of the study's criterion.

A second method to determine needed storage space was discovered during the course of the study. It was not submitted to a jury due to its discovery after the study was partially completed. This method computes storage space on the basis of one square foot of space for every ten dollars of materials purchased annually.

Space Utilization Layout

Section six of Model II involves a space utilization layout for the central warehouse. The following statements are considered significant.

1. Bulk storage is allocated sixty per cent of the warehouse storage space.
2. Small lot storage is allocated forty per cent of the warehouse storage space.
3. Awkward shaped items are stored along walls.
4. Bin storage does not exceed a maximum height of seven feet high and three feet wide.
5. Quantity lots of similar items are placed in the bulk storage area.

Utilization of Electromechanical Materials

Section seven of Model II involves a design for utilization of electromechanical equipment in acquiring, storing, and distributing materials. The machines considered necessary for this operation were previously listed in part three of Table XLII and will not be repeated. It will be necessary to perform some of the data processing duties in the main office since it is not practical to have a full line of data processing equipment in the warehouse. The ability to keypunch in the warehouse office necessitates some duplication of equipment.

The operations of a punched card system for this size school will be similar, with minor modification, to section seven of Model I. Sharing of equipment with other divisions within the school district will present some problems. A summary of the operations of a punched card system applicable to public school warehousing is recorded below.

1. A master stock record card is keypunched with the following information.
   a. Item description and stock number.
   b. Unit of issue and quantity on hand.
   c. Unit price.
2. The receiving section acknowledges delivery and acceptance of materials and notifies the record keeping section.
3. The record keeping section keypunches a receipt card for each item of material delivered. The card indicates the stock number, quantity received, unit cost, and receiving notice number.
4. A detailed commodity issue card is keypunched for each stock item to be issued from warehouse stock to schools submitting requisitions.
5. The item issue cards contain the school number, quantity being requisitioned, item stock number, and account number.
6. The issue cards are then utilized to prepare packing lists which serve as authorization to distribute supplies and materials.
7. One copy of the packing list is signed, serving as a delivery acknowledgement, as the materials are delivered to the school.
8. The receipts and issue cards are merged with the master record cards to adjust the stock quantity on hand.

9. As the available supply of any item falls below the minimum order quantity a credit balance appears on the master stock record card.
10. The credit balance cards are then passed through a sorter and reproduced into a purchasing authorization card.
11. The issue cards representing items delivered to schools are reprocessed for the production of the monthly reports.
12. A stock status report is prepared from the master stock record cards for review of all stock items and purposes of inventory.

# BIBLIOGRAPHY

## A. BOOKS


Brunstetter, M. R. Business Management In School Systems of Different Sizes. New York: Bureau of Publications, Teachers College, Columbia University, 1931.

Elzay, Jack and Cleve O. Westby. School Plant Maintenance. Washington, D. C.: American Association of School Administrators, (n.d.).

Farquar, H. H. Factory Storekeeping. New York: McGraw-Hill Book Company, 1922.

Fisher, Ronald A., and Frank Yates. Statistical Tables for Biological, Agricultural, and Medical Research. New York: Hafner Publishing Company, Inc., 1963.

Fredrick, John H. Public Warehousing. New York: The Ronald Press, 1940.

Fredrick, John H. Using Public Warehouses. Philadelphia: Chilton Company, 1957.

Goodland, John I. Computers and Information Systems in Education. New York: Harcourt, Brace and World, Inc., 1966.

Gores, Harold B. Planning for Elementary Schools. Elementary School Planning Institute, Stanford University, Stanford, California, 1965.

Grieder, Calvin, and William Everett Rosenstengel. Public School Administration. New York: The Ronald Press Company, 1954.

Hanlin, Harry R. Stowage Red Book. New York: Traffic Publishing Inc., 1944.

Heer, Amos Leonard. The Present Status of Business Executives in the Public Schools of the United States in Cities of 25,000 and More Inhabitants. Kent, Ohio: Kent State Normal College, (n.d.)

Hill, Frederick W., and James W. Colmey. School Business Administration in the Smaller Community. Minneapolis: T. S. Denison & Company, Inc., 1953.

Imer, John R. Materials Handling. New York: McGraw-Hill Book Company, Inc., 1953.

Knezevich, Steven J., and John G. Fowlkes. Business Management of Local School Systems. New York: Harper and Brothers, 1960.

Linn, Henry H. School Business Management. New York: The Ronald Press Company, 1956.

MacConnell, James D. Planning for School Buildings. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1957.

Moehlman, Arthur B. Public School Plant Program. New York: Rand McNally & Company, 1929.

Morphet, Edgar L., Roe L. Johns, and Theodore L. Reller. Educational Administration Concepts, Practices and Issues. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1959.

Mossman, Frank H. Logistics of Distribution Systems. Boston: Allyn and Bacon, 1965.

Reeder, Ward G. The Fundamentals of Public School Administration. New York: The Macmillan Company, 1958.

Roe, William H. School Business Management. New York: McGraw-Hill Book Company, Inc., 1961.

Smith, Harry P. Business Administration of Public Schools. New York: World Book Company, 1929.

Stocker, Harry E. Materials Handling Principles, Equipment and Methods. New York: Prentice-Hall, Inc., 1946.

Whitlock, James. Automatic Data Processing in Education. New York: The Macmillan Company, 1964.

## B. PUBLICATIONS OF THE GOVERNMENT, LEARNED SOCIETIES, AND OTHER ORGANIZATIONS

Agency for International Development. How to Store and Warehouse Commodities. Washington: Government Printing Office, 1966.

Agency for International Development. The Story of a Requisition to G. S. A. Washington: Government Printing Office, 1966.

Burns, H. Spilman. Purchasing and Supply Management Manual For School Officials. Bulletin No. 22. Evanston, Illinois: Association of School Business Officials of the United States and Canada, 1962.

General Services Administration. The Economic Order Quantity. Washington, D. C.: Government Printing Office, 1953.

General Services Administration. Warehouse Operations Handbook. Washington, D.C.: Government Printing Office, 1953.

Stram-Steel Corporation. Warehouse and Truck Terminal Buildings. Houston: Stram-Steel Corporation, 1966.

## C. PERIODICALS

Buehring, Leo E. "Automation: A.S.B.O. Sees It Everywhere", The Nation's Schools, December, 1962, pp. 54-57.

Eaton, R. B. "Putting a Central Warehouse into Operation", The American School Board Journal. October, 1950, pp. 23-34.

Mitchell, Herbert S. "Central Warehouse System", The American School Board Journal, February, 1958, pp. 53-54.

Reid, John L. "Warehouse With Personality Along With Utility", Nation's Schools, Volume 62, November, 1958, p. 63.

Swenson, Harold S. "Is Storage Your Problem?" The American School Board Journal, April, 1966, p. 31.